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THE ECONOMIC ROLE OF GOVERNMENT: MANAGING RENT-SEEKING

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IRIS Summary **Working Paper No. 74**
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This paper adopts an approach to rent-seeking which allows for such behavior, and therefore assumes that government may in fact be susceptible to rent-seeking because it is made up of self-interested individuals, but at the same time assumes that there might be others in authority who seek to mitigate the adverse consequences of rent-seeking. *This mitigation might be achieved* through institutions which determine the rules of the rent-seeking game. In particular, there may be differences in the effectiveness of the rent-seeking outlays of different groups of individuals, and there may be differences in the timing of those outlays.

Previous work of Kohli is first summarized in the paper. The main results are:
1. In a Nash equilibrium, rent-seeking costs are greatest when the two contenders are equally effective.
2. In a Stackelberg equilibrium, these costs are greatest when the leader is somewhat more effective.
3. Comparing the two types of equilibria, the rent-seeking costs are higher in the Stackelberg case when the leader is more effective, but not too much more.
4. If the potential Stackelberg leader is less effective, then everyone is better off if the rent-seeking takes place in a Stackelberg situation rather than a in a Nash game.

The paper goes on to examine the impact of distributional considerations, in the form for different weights of different rent-seekers in a Utilitarian objective function, on the above results. Once again, there is a 'worst' case for relative effectiveness. The paper also shows how the answer might change when welfare weights themselves are related to relative effectiveness. It goes on to show that the previous results on comparing Stackelberg and Nash equilibria are qualitatively robust to allowing for non-equal welfare weights on the rent-seekers.

For institution-makers who anticipate rent-seeking, the lesson of such analysis is that one may be able to mitigate its effects. In one of our cases, favoring the group that will be the underdog in terms of effectiveness by allowing it to move first or otherwise precommit is better for everyone. It may be possible to build such criteria into legal or political institutions, though this will require more situation-specific analyses.

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1. Introduction

An extreme view of government is that it is composed of entirely self-interested individuals, and this makes it susceptible to lobbying, corruption, rent-seeking and other behavior in that domain. No doubt, this view is supported by various current and historical examples. At the other pole is the characterization of government as an agent of its constituents, seeking to maximize an agreed upon measure of social welfare that appropriately aggregates constituents' preferences. This view may seem somewhat further from our understanding of human nature. And yet the record of progress in governmental forms suggests that one cannot ignore this optimistic characterization.

Perhaps a compromise approach is the best. In this paper, we take such a position. We assume that rent-seeking occurs and that the government is susceptible to its influence.

But we also assume that the government will try to mitigate its effects. Two factors explain any seeming contradiction between these assumptions. First, there is a difference in timing: institutions that provide the framework within which subsequent routine economic actions occur are put in place infrequently, and subject to inertia. Second, the individuals who frame institutions may be different from those who daily implement economic policies. The model we present will still be a stylized and simplified version of reality, but we hope it provides a first step towards developing an analysis of how rent-seeking may be managed and its costs mitigated.

The rent-seeking literature is large. Its focus, however, is to take a given set of assumptions about the institutional structure and the technology of rent-seeking, and to derive a measure of the waste in resources that results. Our work will instead seek to compare different institutional structures and the resulting costs of rent-seeking, with the ultimate goal of providing some guidance as to how those costs may be reduced. We take as given that there will be situations where rents are created and contested. Even if the economic role of government is kept to a classical minimum, such as providing pure public goods, the potential for rents and lobbying exists. Our point of departure will be the work of Kohli (1992), and we next summarize the relevant analysis and results from that work. We keep technical details at a minimum, referring the reader to the source for those.

2. A Model of Rent-Seeking

The simplest model that illustrates the basic insights is used. There are two persons or groups engaged in contesting a fixed rent. Each receives a share of the rent that depends on her effort, which she chooses, the other's effort, and her relative effectiveness, which is given. This relative effectiveness can vary due to prior relationships, access to communication channels, size and so on. The two actors are assumed to behave noncooperatively and, initially, choose their lobbying or rent-seeking efforts simultaneously. These assumptions, except for the possibility of differences in effectiveness of lobbying (Rogerson, 1982, being a notable exception), are common in this literature.

The notation is as follows:

R : the rent to be divided or shared

v_i : the expenditure incurred by person, firm or group i

a : the relative effectiveness of person 1

The relative effectiveness parameter enters the determination of the shares of rent as follows:

person 1's share is $s_1 = \frac{av_1}{(av_1 + v_2)}$

person 2's share is $s_2 = \frac{v_2}{(av_1 + v_2)}$

These are not defined for $(v_1, v_2) = (0,0)$ in which case we set s = 1/2.

This formulation assumes a form of constant returns to lobbying expenditure, but this can be relaxed without affecting the main insights.

Person 1's objective is then to solve $\max_{v_1} \; W_1 = s_1 R - v_1 = \frac{av_1 R}{(av_1 + v_2)} - v_1$.

The other person has a similar objective function.

To derive the Nash equilibrium, we differentiate each person's objective function, set the derivatives equal to zero - which implicitly defines the reaction functions - and solve two equations in the two unknowns v_1^* and v_2^*. We also check the second order conditions for each person.

The result of these operations is the Nash equilibrium:

$$v_1^* = v_2^* = \frac{aR}{(1+a)^2}$$

This symmetry of outcomes, despite the symmetry of affectiveness, comes about because the marginal effects on shares of rent due to lobbying have similar forms for the two sides.

The total cost of the rent-seeking, assuming as is usual in this literature that the rent-seeking expenditures are pure waste rather than transfers, is just the sum, or double the individual outlay. In honor of Tullock's seminal (1967) contribution, these are termed Tullock costs:

$$T.C.^N = \frac{2aR}{(1+a)^2}$$

Finally, some simple differentiations show that these costs are maximized, given R, at a = 1, i.e., when the two rent-seekers are equally effective. This result is discussed further below.

At this point it may be helpful to provide some interpretations. One can think of many situations where one lobby, or a subset, if there are more than two, has greater effectiveness than the other. Industrialists competing for a protectionist policy or award of monopoly can differ in effectiveness because of differential degrees of association with the government - the industrialist whose brother-in-law is the Minister for Industries could have a distinct advantage over others. Labor unions and capitalists, or agriculturists and industrialists, can differ in effectiveness because of government ideology. Consumers and industrialists can differ in their effectiveness due to differential degrees of learning by doing effects. In many developing countries consumer organizations are poorly developed relative to the lobbying network of industrialists. In the stylized model, these differences in effectiveness are captured in the parameter "a," and the further it is from one, the greater the asymmetry in lobbying effectiveness and the lower the costs of rent-seeking.

The result then seems to fit in with Bardhan's (1984, p. 61) analysis of the political economy of development in India, "When diverse elements of the loose and uneasy coalition of the dominant proprietary classes pull in different directions and when none of them is individually strong enough to dominate the process of resource allocation, one predictable outcome is the proliferation of subsidies and grants to placate all of them."

It is also interesting to compare India and South Korea in this context. As Bardhan

(1984) has noted, because of the conflicts between the equally influential "rent-seeking proprietary classes," the Indian economy has become "an elaborate network of patronage and subsidies." In contrast, in Korea, government decision-making is "untrammelled by the checks and balances of a multi-polar political system." As Datta-Chaudhuri (1990, p. 36), notes, "Land reforms destroyed the political power of the landed aristocracy and helped the emergence of the commercial and middle classes as the dominant elite in the country."

3. The Timing of Rent-Seeking

Previous literature has focused on the case of non-cooperative simultaneous move games, resulting in Nash equilibria. However, in many cases, it makes more sense to analyze Stackelberg equilibria. Consider, for example, the case of lobbying for a protectionist policy. The industrialist lobbies for a protectionist policy and then consumers counter-lobby against the protection. Here, the industrialist first commits to its strategy, and should appropriately be modelled as the Stackelberg leader. The consumers respond to the industrialist's strategy, acting as the followers. Similarly, some cases of lobbying for monopoly regulation are more appropriately analyzed for Stackelberg equilibrium.

Therefore, consider the case where agent 1 acts as the leader, and use the superscript

SL for her, and SF for the follower. The following analysis is taken from Kohli (1992). The leader takes account of gent 2's reaction function in her objective function. Person 2's reaction function is

$$v_2 = \begin{cases} \sqrt{av_1R} - av_1, & 0 < v_1 < R/a \\ 0, & v_1 > R/a \end{cases}$$

Hence, the leader's objective function becomes

$$W_1 = \frac{av_1R}{\sqrt{av_1R}} - v_1$$

Differentiating this, $\frac{1}{2}\sqrt{\frac{aR}{v_1}} - 1 = 0$.

So,

$$v_1^{SL} = \frac{aR}{4}$$

and

$v_2^{SF} = \frac{aR}{2} - \frac{a^2R}{4} = \frac{aR(2-a)}{4}$, which is positive for $a \leq 2$.

Thus,

$$T.C.^S = \frac{aR(3-a)}{4}$$

and

$$s_1 = \frac{a}{2},\ s_2 = 1 - \frac{a}{2}.$$

For a > 2,

$$v_1^{SL} = \frac{R}{a},\ v_2^{SF} = 0$$

and

$$T.C.^S = \frac{R}{a}.$$

Now simple differentiation and algebra show that the Tullock costs are maximized in this case when a = 3/2, i.e., when the two players are not equally effective in lobbying, but rather when the leader is somewhat more effective. To understand this result, one can again examine the equilibrium outlays as functions of "a." For the leader, $v_1^{SL} = aR/4$, which is always increasing in "a." For the follower, $v_2^{SF} = aR(2-a)/4$. This is increasing in "a" for a < 1, and decreasing for a > 1. Hence, the Tullock costs, which are the sum of v_1^{SL} and v_2^{SF}, must be increasing at a=1. As "a" continues to increase, however, the reduction in the follower's outlay begins to counteract the increase in the leader's expenditure, and the Tullock costs start to decline in "a."

4. Comparing Nash and Stackelberg Equilibria

It is now instructive to compare the two rent-seeking equilibria. Using the expressions from the previous sections for a < 2,

$$T.C.^N - T.C.^S = \frac{2aR}{(1+a)^2} - \frac{aR(3-a)}{4}$$

$$\begin{array}{lll} > 0 & \text{as} & a < 1 \\ = 0 & & a = 1 \\ < 0 & & a > 1 \end{array}$$

For a ≥ 2,

$$T.C.^N - T.C.^S = \frac{2aR}{(1+a)^2} - \frac{R}{a}$$

$$<0 \ \textit{for} \ 2<a<1+\sqrt{2}$$

$$>0 \ \textit{for} \ a>1+\sqrt{2}$$

Note that when the two lobbyists have equal influence, the Tullock costs are the same whether they play Nash or Stackelberg. Further, examination of the shares of rent received and the net payoffs reveals that these are the same for each player under the two equilibria, when a=1. That is, for a=1, the Nash and Stackelberg equilibria are identical.

In general, however, when the two players have asymmetric effectiveness of lobbying, the Tullock costs, the shares of the rent received and the net payoffs differ. The Tullock costs are higher in the Stackelberg case when "a" is between 1 and $1+\sqrt{2}$. The upper bound's precise value is assumption dependent and not significant, but the general nature of the result is instructive. If the more effective person is able to precommit, and does not have an overwhelming advantage in rent-seeking effectiveness, the rent-seeking costs are higher than without the precommitment possibility.

It is also instructive to look at the equilibrium lobbying outlays as functions of "a". For the Nash case,

$$v_1 = v_2 = \frac{aR}{(1+a)^2} .$$

Since this is increasing in "a" for a < 1, and decreasing in "a" for a > 1, and since the

Tullock costs are just twice this, we get the result that the Tullock costs are maximized at a=1. The behavior of the equilibrium outlays as functions of "a" is easy to understand when one recalls that "a" measures the relative effectiveness of lobbying, so the outcome must be symmetric when "a" is replaced by its reciprocal.

For the Stackelberg case, recall that the Tullock costs are maximized when a=3/2. While this exact value is not important, the key fact is that it is greater than one. It is difficult to provide more precise intuition for some other aspects of the comparison between the Nash and Stackelberg Tullock costs. It is reasonable, for example, that for extreme values of "a," the Tullock costs should be lower for the Stackelberg case: for example, when the leader is much more effective than the follower, the latter drops out completely. This never happens in the Nash case.

The Tullock costs are not the only outcome of interest. It is also useful to compare the distribution of the rent that results from the lobbying process in the Nash and Stackelberg cases. For the Nash case, the shares are simply a/(1+a) and 1/(1+a). The shares therefore reflect the relative effectiveness of the two lobbyists. In the Stackelberg case, the shares are a/2 and 1-a/2 respectively, for leader and follower. In fact, agent 1's share is higher as a Stackelberg leader than in the Nash game if and only if $a > 1$.

From the lobbyists' viewpoint what matters is not just the share of rent, but the net welfare after lobbying costs are subtracted. The welfare expressions for each player in the two cases are easily derived. They are:

$$W_1^N = \frac{a^2 R}{(1+a)^2}$$

$$W_2^N = \frac{R}{(1+a)^2}$$

$$W_1^{SL} = \begin{cases} \dfrac{aR}{4} & , a < 2 \\ \dfrac{(a-1)R}{a} & , a \geq 2 \end{cases}$$

$$W_2^{SF} = \begin{cases} \dfrac{(2-a)^2 R}{4} & , a < 2 \\ 0 & , a \geq 2 \end{cases}$$

Using these expressions, it is possible to prove that the Stackelberg leader is better off than in the Nash situation, whatever the value of "a," while the Stackelberg follower is better off than in the Nash case if $a < 1$ (the leader is relatively less effective), and worse off if a > 1. Hence, for a < 1, both lobbyists are better off and the Tullock costs are lower in the Stackelberg game than in the Nash game.

5. Distributional Considerations

It is useful to examine how distributional considerations on the part of the rule maker will affect the above comparisons. In general, one could consider a concave function of the welfare of the rent-seekers, assuming there are no other affected groups. This is quite complicated, however, and we restrict attention to the case where distributional considerations are captured by a parameter γ which represents the relative weight given to the first rent-seeking group. Hence welfare is evaluated as

$$W^i = \gamma W_1^i + W_2^i ,$$

where i = N or S representing the Nash and the Stackelberg cases.

We begin with the case of Nash equilibrium. Here

$$W^N = \gamma W_1^N + W_2^N$$

$$= \frac{\gamma a^2 R}{(1+a)^2} + \frac{R}{(1+a)^2}$$

Differentiation and simplification show that

$$\frac{\partial W^N}{\partial a} = \frac{2R}{(1+a)^3}(\gamma a-1)$$

Hence
$$\frac{\partial W^N}{\partial a} \begin{array}{l} <0 \ , \ a < 1/\gamma \\ =0 \ , \ a = 1/\gamma \\ >0 \ , \ a > 1/\gamma \end{array}$$

Thus W^N has a global minimum at a=1/γ. The implication is that if the welfare of the two groups is evaluated differently, then equal effectiveness is no longer the worst outcome. For example, if γ>1, then the worst outcome occurs when the first group is relatively less effective. It remains the case, however, that the further one moves away from the critical value, now 1/γ rather than one, the higher is welfare.

Further insight may be gained by considering the Tullock costs alone. In this case, allowing for the welfare weighting, these costs are

$$T.C.^N = \frac{(\gamma+1)aR}{(1+a)^2}$$

It is clear that this expression is still highest at a=1. Thus the difference in overall evaluation is coming about because of the different evaluation in this case of the gross gains of rent-seeking to the two groups. Note that when γ=1, this is immaterial because

$W^N = R - T.C.^N$, so that W^N is at a minimum whenever $T.C.^N$ is at a maximum.

A further possibility is that since effectiveness is potentially or partially determined by factors such as closeness to the regulators, there may be a relationship between γ and "a", which may be expressed by writing the welfare weight as a function $\gamma(a)$. If there are similar factors influencing both effectiveness and the relative welfare weighting, we may have $\gamma'(a) > 0$. If, on the other hand, the rule-maker somehow tries to compensate in its welfare evaluation for differences in effectiveness, then $\gamma'(a) < 0$. In either case, the expression for $\frac{\partial W^N}{\partial a}$ becomes

$$\frac{R}{(1+a)^3} \left[2(\gamma a - 1) + (1+a)a^2\gamma'(a) \right]$$

Hence a local minimum for W^N can be above or below $1/\gamma(a)$, depending on whether $\gamma'(a)$ is negative or positive. Furthermore, there can be more than one local minimum, so the evaluation is somewhat complicated.

Turning to the Stackelberg case, the expression for welfare is

$$W^S = \begin{cases} \frac{R}{4}[\gamma a+(2-a)^2] & a < 2 \\ \gamma R(a-1)/a & a \geq 2 \end{cases}$$

Assuming once again that γ is constant,

$$\frac{\partial W^S}{\partial a} = \begin{cases} \frac{R}{4}[\gamma-2(2-a)] & a < 2 \\ \gamma R/a^2 & a \geq 2 \end{cases}$$

Now we have

$$\frac{\partial W^S}{\partial a} \begin{matrix} < 0 & , & a < 2-\gamma/2 \\ = 0 & , & a = 2-\gamma/2 \\ > 0 & , & a > 2-\gamma/2 \end{matrix}$$

Hence W^S has a global minimum at $2-\gamma/2$. Note that as γ approaches zero, this value for "a" approaches 2. As γ becomes large, however, we reach the admissible boundary for "a." Specifically, for $\gamma \geq 4$, the worst case is when a=0, or the first group is completely ineffective, and any increase in the first group's effectiveness will increase welfare.

Next we compare the Nash and Stackelberg equilibria for the case of a general value for γ. We have, for a<2,

$$W^N - W^S = \frac{R(1+\gamma a^2)}{(1+a)^2} - \frac{R}{4}\,[\gamma a + (2-a)^2]$$

After some algebraic manipulations, this becomes

$$W^N - W^S = \frac{R}{4(1+a)^2}\,[a(1-a)(a^2 - a - (\gamma+4))]$$

Since $a^2 - a - (\gamma+4) < 0$ *for* $0 \leq a < 2$, we have

$$W^N - W^S \begin{array}{lcl} <0 & , & 0 \leq a < 1 \\ =0 & , & a = 1 \\ >0 & , & 1 < a < 2 \end{array}$$

Hence this part of the comparison generalizes from the case of $\gamma = 1$ considered earlier. For $a \geq 2$, since the expression for W^S is different, we have

$W^N - W^S = \dfrac{R(1+\gamma a^2)}{(1+a)^2} - \dfrac{\gamma R(a-1)}{a}$, which after some algebra reduces to

$W^N - W^S = \dfrac{R}{a(1+a)^2}\,[a + \gamma(1+a-a^2)]$. The expression in brackets can be equated to zero and solved to obtain a function $\alpha(\gamma)$. It is possible to show that $\alpha'(\gamma) < 0$ and

$\alpha(\gamma)$ = 2 when γ=2. Thus $\alpha(\gamma)$ <2 when γ>2, but this is outside the range of "a" for which the original expression is valid. Thus, for γ>2, the expression W^N-W^S is negative. Finally, note that as γ approaches zero, $\alpha(\gamma)$ approaches infinity, so the range over which welfare is higher in the Nash case is larger. This is intuitively sensible. If the Stackelberg leader is more effective, but has a lower welfare weight, it is more likely that the Nash equilibrium will be better.

To summarize, we have two cases. If γ<2,

$$W^N-W^S \quad \begin{array}{ll} <0 \;, & 0\le a<1 \\ =0 \;, & a=1 \\ >0 \;, & 1<a<\alpha(\gamma) \\ =0 \;, & a=\alpha(\gamma) \\ <0 \;, & a>\alpha(\gamma) \end{array}$$

If $\gamma\ge2$,

$$W^N-W^S \quad \begin{array}{ll} <0 \;, & 0\le a<1 \\ =0 \;, & a=1 \\ >0 \;, & 1<a<2 \\ =0 \;, & a=2 \\ <0 \;, & a>2 \end{array}$$

In the case of $\gamma<2$, the range over which the Nash equilibrium is better shrinks as γ increases.

6. Policy Thoughts

The analysis above suggests two kinds of policy responses in terms of designing the framework within which rent-seeking occurs. First, whatever the timing of rent-seeking efforts, or the possibilities for precommitment, the Tullock costs are lower when the rent-seeking groups differ greatly in effectiveness. Thus, to the extent that this effectiveness is under the control of the government, or institution makers in the government, it is beneficial to enhance the effectiveness of one side over the other. In the case of given social structures and group political influence, this kind of policy may be infeasible, but the analysis indicates where things ought to go if they could. Allowing for distributional considerations does not greatly modify these results. Such considerations may point in the direction of balancing the effectiveness of rent-contesting groups to some extent, but even here great differences in effectiveness are better. A caveat is that we have not allowed for equity considerations in a general way; this could change the results.

Now suppose that the relative effectiveness of rent-seeking groups is given, but the policy-maker can affect the order in which rent-seeking efforts occur. For example, in the case of auctioning of quotas, repeated open bidding or single sealed bidding would correspond to a simultaneous move situation, whereas an institutional arrangement where one party were privileged and allowed to precommit a bid would represent the sequential move case. The analysis of Section 4 gives the striking result that if "a" is less than one, both lobbying groups are better off and the Tullock costs are lower for the Stackelberg case rather than the Nash case. Therefore, if the rules can be set up to favor the "underdog," in the sense of allowing the less effective group to move first or otherwise precommit, this will be supported by everyone.

Things are more complicated in other cases. When "a" is between one and $1+\sqrt{2}$, the Tullock costs are lower in the Nash equilibrium, which will also be preferred by the Stackelberg follower. However, the other group would prefer to be a Stackelberg leader to playing a simultaneous move game. If the rule maker can be insulated from this latter preference, it would choose a setup where the rent-seekers move simultaneously. When "a" is even larger, the rule maker's preferences, as determined by the Tullock costs, coincide with the more effective group in favor of the Stackelberg case, and the less effective group is then worse off. Once again, this neglects distributional considerations.

Distribution can be introduced as a factor in policymaking by letting the rule maker maximize some function of the welfare of the rent-seeking groups. This also incorporates the Tullock costs, since these are private costs for the rent-seekers, but the outcome may not be to minimize the Tullock costs. More generally, one can think of such an objective function as incorporating political constraints as well as objectives: a politically influential group may be able to influence the rules of the rent-seeking game as well as subsequently contesting the rent through lobbying. Such considerations are introduced in Section 5 in a simple way, and the effect on the comparison of welfare for the Nash and Stackelberg equilibria is traced out. Again, the results are not too different from the special case of Section 4.

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